

Common Misconceptions/Teaching Strategies

The Mole:

Misconception: Students may often see the Mole as just a number (1 mole, 2 moles, etc.) but should emphasize that 1 mole is equal to Avogadro's constant, 6.02×10^{23} .

Teaching Strategy: Start off with different counting words, like a couple (=2) or a dozen (=12), and then the mole ($=6.02 \times 10^{23}$). So the mole is related to a specific number and can be used to count anything. In chemistry, the mole is a standard number of particles, 6.02×10^{23} molecules, atoms, or ions, etc. In fact, the mole is an SI Unit for an amount of a substance (Cerveliati et al. 1982).

Chemical Proportions in Compounds:

Teaching Strategy: Molecular modelling kits or Lego can be useful in showing the difference between an empirical formula and a molecular formula. Can mass the atoms making up an empirical formula and relate to the mass of atoms making up different molecular formulas that are whole number multiples of the original empirical formula (e.g. Compare mass of modelling kit atoms for the empirical formula CH, and the molecular formulas C_2H_2 and C_6H_6).

Stoichiometry:

Misconception: Students may try to change the subscripts in chemical formulas rather than the coefficient in front of the chemical formula (remind them that if no coefficient, it is 1).

Teaching Strategy: This part of the unit will go more smoothly if you start with an in-depth review of how to balance equations and a review of the importance of subscripts in chemical equations.

-When introduce idea of molar ratios, make sure that students realize that balanced equations need to satisfy the Law of Conservation of Mass (ie. same number of atoms of each element as reactants and products) NOT number of moles of reactant = number of moles of product (get students to balance equations and then calculate the number of moles to prove point).

-Molar mass is independent of the amount of a compound in the reaction (always g/mol, NOT g/ 2 mol or g/ 3 mol). Eg. Water is 18 g/ mol regardless of which chemical equation it is in.

-Limiting reagent: students might choose the reactant with the smallest number of moles as the limiting reactant (must consider RATIO of reactants instead)

Teaching strategy: Cutouts of cars and wheels, put in different ratios. Have students predict how many cars they can make (one body and 4 wheels). Will find that wheels often run out first, so LIMITING REAGENT, even though more wheels than car bodies.

References:

Cerveliati, A., A. Montuschi, and D. Perugini. 1982. Investigation of Secondary School Students' Understanding of the Mole Concept in Italy. *Journal of Chemical Education*. Volume 59, Number 10: 852-856.